2. Кунда, Н.Т. Організація міжнародних автомобільних перевезень [Текст] : навч. посібник / Кунда, Н.Т. - К.: ВД «Слово», 2010. – 464 с.
3. Про затвердження Положення про робочий час і час відпочинку водіїв колісних транспортних засобів від 29.12.2011 [Електронний ресурс]/ - Режим доступу : \www/ URL: http://zakon1.rada.gov.ua/laws/show/z0811-10#top/ - 6.02.2012 Р. - Загол. з екрану.

Abstract
The coordination of transportation with stock facilities requires the development of accurate schedules of traffic and the definition of the exact time of turnaround trip. The development of these schedules is a laborious work for managers. Therefore, in order to facilitate and automate the time-consuming development of schedules of traffic we have proposed a mathematical model for definition of the time of transportation at international trucking. The article presents materials of theoretical analysis and the algorithm of the mathematical model to determine the duration of turnaround trip at international trucking, taking into account the time for moving, breaks and rest according to the rules of European Agreement concerning the Work of Crews of Vehicles Engaged in International Road Transport (AETR). An algorithm was developed to calculate the optimal duration of a trip in order to coordinate the transportation and loading equipment, as well as for the development of schedules of traffic while organizing international trucking in accordance with the AETR. Also the materials of calculations of the duration of trucking for turnaround trips according to experimental data were presented, using the proposed mathematical model and the effect of individual parameters on the total time of trucking
***Keywords**: international trucking, trucking management, schedule of traffic, turnaround trip, transportation*

УДК 004.94:004.896

DETERMINATION OF THE PARAMETERS OF TECHNOLOGICAL SCHEMES OF FERRITES PRODUCTION WITH A COMPUTER SYSTEM

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У статті розглянута комп'ютерна система для зняття магнітних характеристик. Описана структурна схема і основні модулі програмного забезпечення. Розглянуто метод визначення параметрів технологічних схем виробництва феритів
Ключові слова: комп'ютерна система, магнітні характеристики, модель Джілса – Аттертона, технологічні схеми, виробництво феритів

В статье рассмотрена компьютерная система для снятия магнитных характеристик. Описана структурная схема и основные модули программного обеспечения. Рассмотрен метод определения параметров технологических схем производства ферритов
Ключевые слова: компьютерная система, магнитные характеристики, Модель Джилса – Аттертона, технологические схемы, производство ферритов

1. Introdution

Almost all known types of secondary power sources contain in their composition electromagnetic components, such as transformers and inductors. Typically, these components are produced using different magnetic materials to improve their electrical parameters, as well as to reduce the size and weight.

2. Statement of the problem

When designing schemes that contain inductive element and researching processes in it, it is important to know the method for electromagnetic parameters calculation. In particular, it is required to determine throttle's current on the basis of known voltage (primal problem) or voltage on the basis of known current (inverse problem), and then to calculate the required throttle's electromagnetic parameters using these data. This problem is solved comparatively easily for simple line inductive element, however for throttle with ferrimagnetic core (due to non-linear properties of the latter) connection between voltage and current is established through magnetic characteristics of the core.

3. Work objective

Currently when making devices the developers have a complicated task, which is firstly, selection of the most suitable brand of ferrimagnetic (in terms of magnetization curves) based on scheme's parameters, secondly, search of mathematical models' parameters for modeling. On the other hand, it is useful for producers ferrimagnetic materials' to have information concerning brands of ferrimagnetic materials that are mostly in demand and have an opportunity to manufacture products that meet developers' requirements to the maximum. Otherwise, both developer and producer incur losses.

4. The practical significance

Computer system for magnetic characteristics rating helps in determine the parameters for the mathematical models of the elements with ferromagnetic or ferrimagnetic cores and helps determine the parameters of technological schemes of ferrites production.

Computer system consists of the following modules:

1. Measurement module.
2. Module on calculation of mathematical models' parameters (Jiles-Atherton models and John Chan models).
3. Module on transformation of mathematical models' parameters.
4. Module on activity with database management system
5. Module on selecting parameters for technological schemes of ferrites production
6. Main Control Module (computer system core that ensures all modules interaction and interaction of operating specialist with computer system).

Computer system for magnetic characteristics rating being considered allows to determine parameters of widespread mathematical models and to solve range of issues related to production and testing of ferro- and ferrimagnetic materials.

In particular, computer system for magnetic characteristics rating has the following functions.

1. Magnetic characteristics determination for ferromagnetic and ferrimagnetic materials.
2. Determination of Jiles-Atherton model parameters.
3. Determination of John Chang model parameters.
4. Storage of data on testing.
5. For developers of communications electronics equipment option is included concerning generalisation of requirements to ferrites relying on basic circuits' parameters (induction, voltage).
6. For ferrites producers option is included concerning correction of technological schemes based on parameters of Jiles-Atherton model.

At the moment manufacturers of communications electronics equipment select ferrite products on the basis of ferrimagnetic magnetization curve. Computer system for magnetic characteristics rating allows to collect a great number of requirements from basic circuits of manufacturer of communications electronics equipment, generalize them, select parameters of Jiles-Atherton model with indication of which requirements match which parameters. Let's consider an example (data are random numbers presented only as an example, they are not results estimated by computer system).

Developer of communications electronics equipment has about 8 projects.

Table 1

Example data

Project	Requirements	
	Induction B(T)	Voltage H(A/м)
Project No.1	0.030	14
Project No.2	0.050	16
Project No.3	0.075	20
Project No.4	0.1	22
Project No.5	0.125	25
Project No.7	0.15	30
Project No.8	0.175	35

Data indicated in the tabl.1 are input into computer system for magnetic characteristics rating. After that computer system determines points within magnetization curve (through localization of points in the hysteresis edge loop) by increasing and reducing hysteresis edge loop. After this process completion there will be, e.g. three hysteresis edge loops, which will be transmitted into Module on calculation of mathematical models' parameters (Jiles-Atherton models and John Chang models).

Module will bring back parameters of Jiles-Atherton model (data are random numbers indicated only as an example, they are not results estimated by computer system).

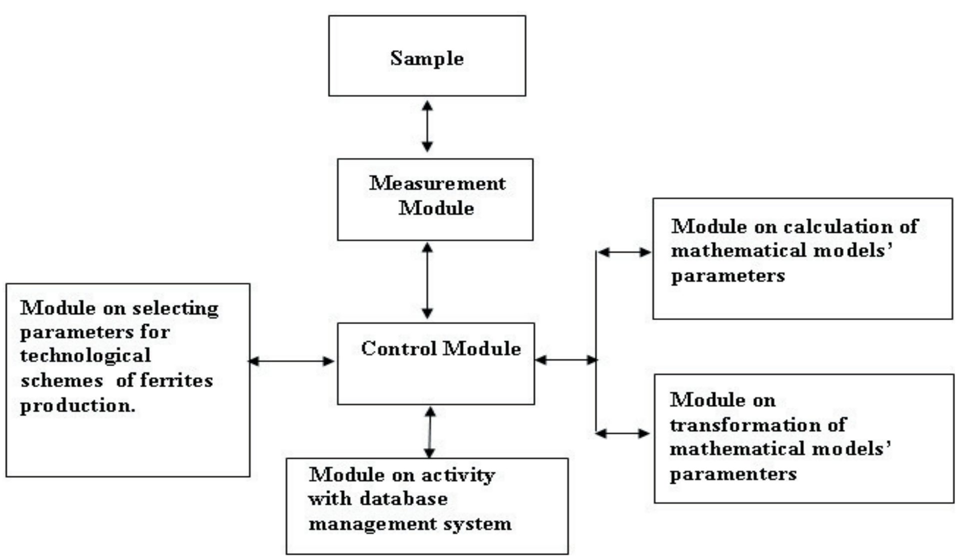

Fig. 1. Structural scheme of computer system for magnetic characteristics rating

Table 2

Example data

Parameters of Jiles-Atherton model					Project
A	C	K	MS	ALPHA	
46.85	0.001	15.976	442.18	0.00026	project No.1, project No.2, project No.8,
100	0.01	160	44.18	0.003	project No.5, project No.6, project No.4
150	0.0001	10	550	0.0004	project No.3, project No.7

Parameters of Jiles-Atherton model are subsequently sent to ferrimagnetic materials manufacturer, as well as used for scheme calibration in systems of automatic communications electronics equipment designing.

Ferrites manufacturers can use computer system for magnetic characteristics rating to correct technological schemes. Originally computer system for magnetic characteristics rating accumulates data on ferrimagnetic samples testing and compares them with parameters of Jiles-Atherton model, after accumulation it restores dependance of technological schemes' parameters on parameters of Jiles-Atherton model through group method of data handling. Dependance received is used to correct technological scheme. Let's consider an example (data are random numbers presented only as an example, they are not results estimated by computer system). To restore dependance there used parameters of Jiles-Atherton model and data of technological scheme applied for sample production. Approximate data structure is represented in tabl. 4.

Table 3

Comparison of technological scheme No. 1 parameters and variables applied in the algorithm of group method of data handling

Phase name	Parameter's name	Variable in group method of data handling
Mixing and grinding	ts1e1p1, ts1e1p2, ts1e1p3	x1,x2,x3
Mixture drying	ts1e2p1, ts1e2p2, ts1e2p3	x4,x5,x6
Briquetting (granulating)	ts1e3p1, ts1e3p2, ts1e3p3	x7,x8,x9
Preliminary bakeout	ts1e4p1, ts1e4p2, ts1e4p3	x10,x11,x12
Repeated grinding and mixing	ts1e5p1, ts1e5p2, ts1e5p3	x13,x14,x15
Moulding powder preparation	ts1ep61, ts1e6p2, ts1e6p3	x16,x17,x18
Formation of a product	ts1e7p1, ts1e7p2, ts1e7p3	x19,x20,x21
Agglomeration under high temperature	ts1e8p1, ts1e8p2, ts1e8p3	x22,x23,x24

In tabl. 3 approximate structure of data required for group method of data handing is presented (i.e. data that were collected on a phase-to-phase basis and comparing was performed with variables, which will be used in the group method of data handling). Number of phases and number of variables per phase can be unspecified and can be set by ferrimagnetic materials manufacturer and his/her technological schemes. Below phases and variables are presented as an example.

Table 4

Comparison of technological scheme No. 1 parameters and parameters of Jiles-Atherton model

Parameters of Jiles-Atherton model					Technological scheme parameters
A	C	K	MS	ALPHA	
46.85	0.001	15.976	442.18	0.00026	ts1e1p1, ts1e1p2... ts1e8p3
100	0.01	160	44.18	0.003	ts1e1p1, ts1e1p2... ts1e8p3
150	0.0001	10	550	0.0004	ts1e1p1, ts1e1p2... ts1e8p3

After setting parameters of Jiles-Atherton model (A, C,K,MS,ALPHA) and dependence restoration, computer system for magnetic characteristics rating will perform selection of parameters for technological scheme.

5. Conclusions

Considered computer system solves the problem of determining the operational parameters of mathematical models of magnetic materials and determine the parameters of the production process flow diagrams ferrites.

References

1. Jiles D.C. Theory of ferromagnetic hysteresis / D.C. Jiles, D.L. Atherton // Magnetism and magnetic materials. – 1983. – vol. 61. – pp. 48–68.
2. Nonlinear transformer model for circuit simulation / Chan J.H., Vladimiresku A., Gao X-Ch., Liebmann P., Valainis J.// IEEE transactions on computer-aided design. – 1991. – vol. 10 – pp. 476–482.
3. Analytical model for the approximation of hysteresis loop and its application to the scanning tunneling microscope / Rostislav V. Lapshin // Review of Scientific Instruments. – 1995. – vol 66. – pp 4718-4730.
4. Zidari B. J-A Hysteresis Model Parameters Estimation Using GA [Текст]/ Bogomir Zidari, Damijan Miljavec // Advances in Electrical and Electronic Engineering. – 20-05. – Vol. 4. – P. 174–177.
5. Penoyer R. The Properties of Mn-Fe Ferrites [Текст] / R. Penoyer, M. Skafer // Journal of Applied Physics. – 19-59. – Vol. 30. – No. 4. – P. 315–321.
6. Koprivica B. Determination of Characteristics of Ferromagnetic Material Using Modern Data Acquisition System [Текст] / Branko Koprivica, Alenka Milovanovic, Milic Djeckic // Serbian Journal of Electrical Engineering. – 2009. – Vol. 6. – No. 3. – P. 451–459.

Abstract

The article describes a computer system for the removal of the magnetic characteristics. It describes a structural scheme of the computer system for the removal of the magnetic characteristics, which consists of the following *software modules: the measuring module, the module of determination of the parameters of mathematical models, the module of transformation of parameters of mathematical models, the module of communication with DBMS, the module of determination of the parameters of technological schemes of production of ferrites. The method of determination of the parameters of technological schemes of production of ferrites was considered. The method is based on a comparison of the parameters of technological schemes of production of ferrites with the parameters of the mathematical model of Giles - Atterton. The comparison is made using the group method of data handling. The group method of data handling (GMDH) relates to a family of inductive algorithms for mathematical modeling of multiparametric data. The method is based on the recursive selective selection of models, on the basis of which more complex models can be built. The modeling accuracy at each further step of recursion increases due to the complication of models*

***Keywords**: computer system, magnetic characteristics, model of Giles – Atterton, technological schemes, production of ferrites*

В даній статті на прикладах декількох задач показано деякі переваги застосування підходу кластеризації критеріального простору при розв'язані багатокритеріальних задач лінійного програмування

Ключові слова: кластеризація, критеріальний простір, багатокритеріальність, лінійне програмування

В данной статье на примерах нескольких задач показаны некоторые преимущества применения подхода кластеризации критериального пространства при решении многокритериальных задач линейного программирования

Ключевые слова: кластеризация, критериальное пространство, многокритериальнисть, линейное программирование

УДК 519.8

ОБГРУНТУВАННЯ ПІДХОДУ КЛАСТЕРИЗАЦІЇ КРИТЕРІАЛЬНОГО ПРОСТОРУ В ВЕКТОРНИХ ЗАДАЧАХ ЛІНІЙНОГО ПРОГРАМУВАННЯ

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1. Вступ

Рушійною силою розвитку теорії прийняття рішень є нові задачі та завдання, які виникають. Так, можна виділити цілий клас прикладних задач [1], які зводяться до багатокритеріальних, критеріальний простір яких складається із великої кількості рівнозначних, непорівнюваних часткових критеріїв. Це зв'язано з тим, що при дослідженні складних систем і об'єктів використання скалярної задачі оптимізації приводить до математичної моделі, яка є неадекватна реальній задачі.

Тому є актуальним створення спеціальних методів обробки інформації для розв'язання багатокритеріальних задач великої критеріальної розмірності. Дана робота присвячена обгрунтуванню застосування спеціально розробленого математичного апарату, що оснований на підході кластеризації критеріального простору [2] для розв'язання векторних задач лінійного програмування із критеріальним простором великої розмірності.

2. Аналіз літератури

Характерною особливістю багатьох практичних задач дослідження є їх велика розмірність. При такій вимірності класичні методи математичного програмування виявляються малоефективними. Це зумовлює необхідність розробки спеціальних методів, призначених для задач такого типу.

Велика розмірність може виникнути в критеріальному просторі та просторі альтернатив.

Вирішенням проблеми великої розмірності в критеріальному просторі займалися Воронін А.М., Фети-